Memoirs of the Museum of Victoria 49(1): 73-81 (1988) ISSN 0814-1827

THREE NEW INDO-PACIFIC DAMSELFISHES OF THE GENUS *CHROMIS* (POMACENTRIDAE)

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Abstract

Randall, J.E., 1988. Three new Indo-Pacific damselfishes of the genus *Chromis* (Pomacentridae). *Memoirs of the Museum of Victoria* 49: 73-81.

The following new species of pomacentrid fishes of the genus *Chromis* are described: *C. alpha, C. caudalis* and *C. delta*. All are deep-reef species of the western Pacific, including Australian waters. They were designated as *Chromis* A, C and D respectively by G. R. Allen (1975) in his *Damselfishes of the South Seas*. *C. alpha* is distinct in having 3 spiniform caudal rays, usually XIII,12 dorsal rays, 16-18 pectoral rays, and a moderately deep body (depth 1.8-2.0 in SL); in life there are usually one or more small yellowish spots on the scales of the body, especially anterodorsally, the lower part of the body is blue, and the anal fin largely deep blue. *Chromis caudalis* and *C. delta* are both dark brown with pale caudal peduncle and fin, a large black spot at the pectoral base, 2 spiniform caudal rays, and usually XII,13 dorsal rays. *Chromis caudalis* usually has 17 pectoral rays (usually 16 for *delta*), usually 14 lateral-line scales (usually 13 for *delta*), a deeper body (1.65-1.85 in SL, compared to 1.8-2.1 for *delta*), and longer caudal and pectoral fins; the dark spot on the pectoral base is hemispherical in *caudalis* and round in *delta*; the pectoral axil of adults of *caudalis* is bright blue in life.

Introduction

The author has made a long-term study of the Indo-Pacific species of the damselfish genus *Chromis* which has resulted in the following papers to date: Randall and Swerdloff (1973) reviewed the eight Hawaiian species of the genus; Allen and Randall (1980) reviewed the Red Sea species of the family Pomacentridae which included seven species of *Chromis*; Randall, Ida and Moyer (1981) recognised 20 species of the genus from Japan and Taiwan. Randall and Allen (1982) described *C. pelloura* from the Red Sea; and Randall and McCarthy (1988) named a new species from the Persian Gulf and Gulf of Oman.

The purpose of the present paper is to provide descriptions of three common species of *Chromis* which are typically found in deep-reef habitats in the western Pacific. One of the species extends its range eastward to the Society Islands. All three occur in Australian waters. These species were designated as *Chromis* spp. A, C and D by Allen (1975).

Lengths given for type specimens are standard length (SL) taken from the front of the snout to the base of the caudal fin. Proportional measurements are rounded to the nearest 0.05. Meristic and proportional data appearing in parentheses refer to paratypes if different from the holotype. Body depth is the maximum depth to the extreme base of the dorsal spines; measurements of fin spines are also taken to the base of these elements. Interorbital width is the least fleshy width and orbit diameter the maximum fleshy diameter. Caudal concavity is the horizontal distance between the tips of the longest and shortest caudal rays. Lateral-line scale counts were made only of those scales in the dorsoanterior series with tubes; pored scales which may be found posteriorly in the series were not counted. Gill-raker counts include all rudiments; the raker at the angle is contained in the lower-limb count. Tables 1 and 2 summarise the meristic data for all three species. For a diagnosis of the genus *Chromis* see Randall, Ida and Moyer (1981).

Type specimens have been deposited at the following institutions: Academy of Natural Sciences of Philadelphia (ANSP); Australian Museum, Sydney (AMS); Bernice Pauahi Bishop Museum, Honolulu (BPBM); Muséum National d'Histoire Naturelle, Paris (MNHN); U.S. National Museum of Natural History, Washington, D.C. (USNM), and Western Australian Museum, Perth (WAM).

Table 1. Counts of Fin Rays of Species of *Chromis*

	Dorsal Rays					Anal Soft Rays				Pectoral Rays			
	XII	XIII	12	13	14	11	12	13	14	15	16	17	18
C. alpha	1	45	44	2		1	43	2			1	20	25
C. caudalis	25		4	20	1		2	23			3	20	2
C. delta	42		3	38	1		4	37	1	3	38	1	

Table 2. Counts of Tubed Lateral-line Scales and Gill rakers of Species of *Chromis*

	Lateral-line Scales					Gill Rakers							
	12	13	14	15	16	24	25	26	27	28	29	30	31
C. alpha			5	29	12				10	19	11	5	1
C. caudalis		1	17	7				1	13	4	4	2	1
C. delta	5	35	2			1	7	17	13	4			

Chromis alpha sp. nov.

Figure 1

Chromis sp. "A" Allen, 1975: 94, middle fig. of p. 96.
Chromis sp. 1 Allen and Steene, 1979: 42.
Chromis sp. "A" Wass, 1984: 19.
Chromis sp. Randall and Randall, 1987.

Material examined. Holotype: Society Islands, Tetiaroa, off W side of Rimatuu Islet, outside reef in 45 m, 60° slope with rich coral bottom, spear, J.E. Randall, 24 Apr 1973, BPBM 14993, female (84.0 mm).

Paratypes: Society Islands, Tahiti, outside reef off Papeete Harbor, 25-40 m, spear, J.E. Randall, 29 Mar 1971, BPBM 11544, (2: 78.8-88.0 mm).

American Samoa, Tutuila, Fagatele Bay, E side, 39 m, spear, J.E. Randall, 27 Apr 1973, BPBM 14999 (77.5 mm); Fagatele Bay, edge of reef in 30-38 m, rotenone, J.E. Randall, R.C. Wass and G. Yamasaki, 8 May 1974, BPBM 17506 (76.6 mm).

Tonga Islands, Vava'u, SW side off Mo'ungalafa Mt., at latitude 18°29′30″S, 37 m, rotenone and spear, J.E. Randall and K. Okamoto, 18 Mar 1983, BPBM 30951 (2: 80.5-84.0 mm).

Fiji, Viti Levu, entrance to Suva Harbour, 30 m rotenone, B.A. Carlson, 10 Jul 1974, WAM P25283-001 (82.0 mm); NW tip of Great Astrolabe Reef, S of Usborne Pass (18°42′S, 178°29′E), ocean side of reef to 40 m, rotenone, V.G. Springer et al., 14 May 1982, BPBM 31159 (2: 78.0-86.3 mm).

Vanuatu, Éfaté, Undine Bay, G.R. Allen and W.A. Starck II, 24 Jun 1973, AMS I.17474-003 (78.0 mm); Espiritu Santo, Tutuba Island (15°45′S, 166°50′E), 45 m, explosives, G.R. Allen, 27 Jun 1973, WAM P24939 (5: 75.0-85.0 mm).

Australia, Queensland, Great Barrier Reef, Escape Reef, Australian Museum party, 28 Oct 1981, AMS I.22580-012 (80.5 mm); Lizard Island area, Australian Museum party, Nov 1975, AMS I.19476-021 (2: 75.0-76.0 mm).

Solomon Islands Guadalcanal, Doma Reef, 35 m, rotenone, J.E. Randall and G.R. Allen, 15 Jul 1973, BPBM 16083 (2: 50.8-76.9 mm).

Marshall Islands, Kwajalein Atoll, S end, 50 m SE of entrance to small boat passage, 70° drop-off with caves, 46 m, J.E. Randall, N.A. Bartlett, R. Hergenrother and K. Burnett, 8 Apr 1976, BPBM 19979 (71.0 mm); same data as preceding, MNHN 1976-129 (76.0 mm); Enewetak Atoll, Rigili (Leroy) Islet, W side of ocean reef, drop-off in 46 m, rotenone, J.E. Randall, G.W. Tribble, A.Y. Suzumoto and P. Lamberson, 5 Jul 1975, BPBM 18388 (77.0 mm).

Caroline Islands, Ponape (5°52′N, 158°6′E), SW side, ocean side of barrier reef to 36.5 m, rotenone, V.G. Springer et al., 15 Sep 1980, USNM 223922 (4: 72.8-82.5 mm).

Mariana Islands, Guam, Cocos Island, reef off NW side, steep drop-off, 29-37 m, rotenone, J.E. Randall, P. Helfrich, R. S. Jones and H. Kami, 28 May 1968, BPBM 6898 (4: 68.8-76.9 mm).

Palau Islands, Augulpelu Reef (SE of Koror), SW side at base of drop-off in 34-52 m, rotenone, J.E. Randall, A.R. Emery and E.S. Helfman, 22 Apr 1970, BPBM 30938 (14: 60.7-75.5 mm); Augulpelu Reef, quinaldine, W.A. Starck II, 4 Mar 1972, AMS I.16650-001 (46.2 mm).

Papua New Guinea, Madang, outer reef off middle of Kranket Island, 25-35 m, rotenone, G.R. Allen, 14 May 1972, BPBM 14702 (2: 57.3-59.8 mm); near Rapa Point (5°28′S, 155°37′E), steep drop-off near shore, 32-40 m, rotenone, G.R. Allen, 4 Oct 1983, WAM P28165-007

Figure 1. Holotype of *Chromis alpha*, BPBM 14993, 84.0 mm SL, Tetiaroa, Society Islands.

(75.0 mm); WAM P27826-025 (3: 71.0-75.0 mm); Admiralty Islands, Manus, S coast about 3 km from Momote Airfield (2°4'S, 147°25'E), vertical drop-off, 35-41 m, rotenone, G.R. Allen and R. Knight, 2 Sep 1986, WAM P27826-025 (3: 71.0-75.0 mm).

Philippines, Mactan Island (E of Cebu), off marine laboratory of University of San Carlos, vertical drop off in 30 m, spear, J.E. Randall, 25 Jun 1975, BPBM 18467 (3: 70.5-75.9 mm); Palawan, Puerto Princesa (9°44'N, 118°45'E), 12 m rotenone, R.E. Schroeder, 2 Jul 1979, USNM 273546 (76.0 mm).

Indonesia, Molucca Islands, Nusa Laut, N shore at Tandjung Tala, steep drop-off, 12-18.5 m, rotenone, V.G. Springer and M.F. Gomon, 16 Jan 1973, USNM 209903 (77.7 mm).

Cocos-Keeling Islands, Turk Reef, N side, drop-off in 36-49 m, spear, W.F. Smith-Vaniz, 20 Mar 1974, ANSP 134269 (82.2 mm).

Diagnosis. Dorsal rays XIII, 12 (one of 45 paratypes with XII spines and two with 13 rays); anal rays II,12 (rarely 11 or 13); pectoral rays 18 (16-18, rarely 16); spiniform caudal rays 3; tubed lateral-line scales 15 (14-16, usually 15); gill rakers 8 + 21 (7-9 + 19-23).

Body depth 1.85 (1.8-2.0) in SL; head length 3.2 (3.0-3.25) in SL; snout length 3.75 (3.5-4.05) in head; orbit diameter 2.8 (2.6-3.0) in head; interorbital width 2.6 (2.7-2.95) in head; caudal peduncle depth 2.0 (1.95-2.3) in head.

No auxiliary scales on body. Preopercular margin not serrate. Anterior nostril with narrow fleshy rim, slightly higher posteriorly; posterior nostril small elongate pore diagonally above and behind anterior nostril near orbit in front of upper margin of pupil. Pores of lateralis system on head small. Free margin of suborbital short, ending below a vertical at front edge of pupil.

Fifth to eighth dorsal spines longest, 1.55 (1.55-1.8) in head; interspinous membranes of dorsal fin moderately incised; margin of soft portion of dorsal fin somewhat pointed, fourth ray longest; base of soft portion of dorsal fin contained about 2.7 times in base of spinous portion; second anal spine 1.25 (1.2-1.35) in head; margin of soft portion of anal fin broadly rounded; caudal fin deeply forked, lobe tips acute but not filamentous, caudal concavity 3.75 (3.2-4.4) in SL; pectoral fins long, 2.5 (2.5-2.95) in SL; pelvic fins 3.05 (2.75-3.15) in SL.

Colour of holotype in alcohol. Brown, slightly darker dorsally than ventrally, centres of scales a lit-

tle paler than edges; narrow dark brown bar underlying posterior edge of preopercle and another along upper edge of gill opening; indistinct small black spot at upper base of pectoral fin; upper third to half of pectoral axil black; distal unscaled portion of spinous part of dorsal fin light brown; membranes of outer half of soft part of dorsal fin hyaline, rays brown; anal fin dark brown, only distal last few rays and associated membranes pale; caudal fin dark brown, rays and membranes shading to pale distally; paired fins pale, pelvics light brown laterally.

Colour of holotype when fresh. Scales of upper five-sixths of body and postorbital head with dark brown edges and greenish centres containing one or more yellowish blotches (the blotches yellow on head and anterodorsally on body); lower sixth of body purplish blue; narrow dark bar on opercular edge and gill opening above level of pectoral base; upper preopercular margin in a dark brown bar; median fins dark brown except posterior membranes which are clear and outer spinous portion of dorsal fin and outer anal fin which are orangish brown; paired fins slightly dusky, base of the pectorals dark brown, upper corner with still darker spot.

The following colour note was made from the four paratypes from Guam (BPBM 6898, 68.8-76.9 mm): dark greenish on back and sides, scales edged in blackish and centres with some dull yellow blotches; ventral part of head and body greyish blue; dorsal fin coloured like body; anal fin deep blue (blue-green anteriorly and basally); pectoral fins light grey with curved brown bar at base; pelvic fins greyish blue; upper edge of opercle and preopercle blackish. The blue ventral colour of the body faded soon after capture. There is considerable variation in the development of the yellow blotches in this species. On some individuals the spots are only faintly visible. Some fish show an intensification of the yellow spots on the caudal peduncle as well as anterodorsally on the body. Underwater the blue ventral part of the body is very evident; particularly striking is the deep blue of the anal fin and the even brighter blue of the outer unscaled part of the fin.

Etymology. Named *alpha* from the Greek *alphos*, white-spotted, as from leprosy, in reference to the pale spots on the head and body. Also the name was chosen because alpha is the first letter of the Greek alphabet. This fish was first diagnosed and illustrated by Gerald R. Allen (1975) who referred to it as *Chromis* sp. "A".

Distribution and habitat. This species occurs in the western Pacific from the Philippines through Indonesia and New Guinea to the Great Barrier Reef and eastward in Oceania to the Marshall Islands in the Northern Hemisphere and the Society Islands in the Southern. Its typical habitat is steep outer reef escarpments with small caves and ledges. It has been collected in 12 to 52 m, though is rarely encountered in less than 20 m. In some areas such as Mactan Island in the Philippines it is among the most common of the deep reef fishes.

Remarks. Chromis alpha is a moderately large species of the genus. Our largest specimen measures 88 mm SL, 124 mm total length. The above proportional measurements were based on ten specimens from 46.2 to 88 mm SL.

This damselfish is most closely related to an undescribed species of *Chromis* of which specimens have been taken in Kenya, the Maldive Islands, and the Seribu Islands off NW Java. The latter differs in having lower gill-raker counts (25-27) and in colour. It lacks the yellow flecks of *C. alpha* and has a large black area over most of the anal fin.

Chromis caudalis sp. nov.

Figure 2

Chromis sp. "C" Allen, 1975: 94, lower fig. on p. 97.
Chromis sp. 2 Allen and Steene, 1979: 43 (in part).

Material examined. Holotype: Solomon Islands, Alite Reef (off Malaita), outer reef slope, 46 m, spear, G.R. Allen, 24 Jul 1973, BPBM 15613, male (63.2 mm).

Paratypes: Caroline Islands, Ponape, Nankapenparam Reef (NE of Ponape Pass) (7°1'45"N, 158°13'55"E), ocean side of reef, 37-44 m, rotenone, V.G. Springer et al., 9 Sep 1980, USNM 223920 (2: 32.8-33.3 mm); same locality, 27.5-46 m, rotenone, V.G. Springer et al., 20 Sep 1980, USNM 223921 (4: 47.0-56.0 mm).

Palau Islands, Augulpelu Reef (SE of Koror), drop-off on SW side, 15.5 21 m quinaldine, J.E. Randall, 13 Apr 1970, BPBM 9376 (2: 42.4-46.0 mm); same locality, base of drop-off in 34-52 m, rotenone, J.E. Randall, A.R. Emery, and E.S. Helfman, 22 Apr 1970, BPBM 30948 (2: 55.7-56.9 mm); same locality, 46 m, rotenone, G.R. Allen, W.A. Starck II, R.C. Wass and G. Condit, 24 Jan 1972.

Solomon Islands, same data as holotype, BPBM 30950 (4: 55.6-64.8 mm); same locality, W end, steep outer reef slope, 34 m, spear, J.E. Randall, 26 Jul 1973, BPBM 15637 (56.5 mm).

Philippines, Siquijor Islands, about 2 km W of town of Siquijor (9°13.5'N, 123°29'E), 24.5-30.5 m, rotenone, L.W. Knapp et al., 14 May 1979, BPBM 31299 (2: 69.1-75.0 mm).

Indonesia, Molucca Islands, Ambon, NW coast of Ambon Bay about 1 km W of Sikula Point, 20 m, spear,

Figure 2. Holotype of *Chromis caudalis*, BPBM 15613, 63.2 mm SL, Alite Reef, Solomon Islands.

J.E. Randall and G.R.Allen, 18 Jan 1975, BPBM 19242 (2: 53.2-56.0 mm).

Christmas Island (Indian Ocean), off Ethel Beach (10°29'S, 105°40'E), 20-30 m, rotenone, G.R. Allen and R.C. Steene, 18 May 1978, WAM P26080-003 (75.4 mm); Flyingfish Cove, off cantilever, 25-35 m, rotenone, G.R. Allen and R.C. Steene, 27 May 1978, WAM P26099-012 (68.0 mm).

Diagnosis. Dorsal rays XII,13 (12-14, rarely 14); anal rays II,13 (12-13, rarely 12); pectoral rays 18 (16-18, usually 17); spiniform caudal rays 2; tubed lateral-line scales 14 (13-15, usually 14, rarely 13); gill rakers 9 + 20 (7-9 + 19-22).

Body depth 1.7 (1.65-1.85) in SL; head length 3.15 (3.0-3.25) in SL; snout length 3.7 (3.55-3.75) in head; orbit diameter 3.1 (2.6-3.2) in head; interorbital width 2.6 (2.5-2.85) in head; caudal peduncle depth 1.9 (1.8-2.0) in head.

No auxiliary scales on body. Posterior margin and corner of preopercle irregular, usually with a few poorly defined serrae. Anterior nostril with low fleshy rim, slightly higher posteriorly; posterior nostril a small opening diagonally above and behind anterior, near edge of orbit at level of upper edge of pupil. Some pores of lateralis system on head moderately large, especially those near nostrils and above orbit. Free edge of suborbital ending posterior to vertical at rear of pupil.

Last dorsal spine usually longest, 1.95 (1.55-1.9) in head; interspinous membranes of dorsal fin moderately incised; margin of soft portion of dorsal and anal fins acutely pointed, fifth dorsal ray and seventh or eighth anal rays longest; base of soft portion of dorsal fin contained about 2.1 times in base of spinous portion; second anal spine 1.5 (1.25-1.45) in head; caudal fin deeply forked, each lobe tip with 2 very long filamentous rays, caudal concavity 3.2 (1.6-3.2) in SL; pectoral fins moderately long, 2.85 (2.65-2.9) in SL; pelvic fins 2.9 (2.65-2.9) in SL.

Colour of holotype in alcohol. Dark brown, centres of scales paler than edges, particularly ventrally where they form faint pale stripes; caudal peduncle distinctly paler than rest of body, demarcation slightly posterior to rear base of dorsal and anal

fins; edge of orbit narrowly dark; lips slightly paler than rest of head; a narrow black band on side of snout passing anteriorly from middle of edge of orbit (band may be obscured by mucus); edge of opercle above level of pectoral base, posterior edge of preopercle, and ventral edge of suborbital narrowly darker brown than rest of head; large hemispherical black spot basally on pectoral fin, rounded part posterior, straight part coinciding with fin base; axil of pectoral fins black, black extending short distance on side of body dorsal to fin base; dorsal and anal fins dark brown except narrow region posterior to curve from rear base of each fin to attenuate tip which is abruptly hyaline with light brown rays; caudal fin slightly darker than peduncle, rays and membranes becoming pale distally; pectoral fins pale with light brown rays; pelvic fins dark brown.

Colour when fresh. The holotype dark brown, centres of scales on side of head and body yellowish, becoming yellow ventrally where they form stripes on thorax and abdomen; caudal peduncle bluish white, tinged with brown; dorsal and anal fins dark brown except posterior part of soft portion which is abruptly whitish with light brown rays; anterior margin of anal fin narrowly light blue to pointed tip; caudal fin light yellowish brown, shading to pale distally; pectoral fins hyaline with light brown rays and large black spot at base; pelvic fins dark brown, lateral edge narrowly light blue.

The colour illustration of *C. caudalis* in Allen (1975: lower figure of p. 97) shows a narrow light blue margin on the dorsal fin to the pointed tip of the soft portion of the fin and faint light blue edges basally on the caudal lobes; the inner rim of the iris is bright blue.

The axil of the pectoral fins of individuals of this species collected in the Palau Islands and Indonesia was observed to be bright deep blue. This striking colour feature is apparent on underwater photographs taken by the author in Indonesia in which the pectoral axil is visible.

Etymology. This species is named *caudalis* in reference to the very long caudal filaments; it has the highest caudal concavity of any species of *Chromis* (to 1.6 in the SL).

Distribution and habitat. This species is known from Indonesia, Philippines, Solomon Islands, Palau Islands, Caroline Islands and Christmas Island in the eastern Indian Ocean. The author collected two specimens (BPBM 19985, 52.0-61.3 mm) at the southern end of Kwajalein Atoll, Marshall Islands in 46-55 m which are here identified as *C. caudalis*; however they are not designated as paratypes. They did not exhibit the bright blue axil of the pectoral fins, nor did underwater photographs taken of this species at the same locality. It was also photographed underwater at Fanning Atoll in the Line Islands with the pectoral fin in a forward position; no blue is apparent in the pectoral axil. Specimens of *C. caudalis* have been collected in the depth range of 15.5-55 m. The species is typically found on steep outer reef slopes.

Remarks. The largest specimen of *Chromis caudalis* measures 75.4 mm SL and 115 mm in total length. The above proportional measurements were based on 11 specimens from 42.2 to 75.4 mm SL.

This species appears to be most closely related to *C. delta* which is described herein (see *Remarks* for *delta* for differentiation from *caudalis*) and to *C. alleni* Randall, Ida and Moyer from southern Japan. The latter differs in the orangish brown ground colour, a slightly deeper body, and more tubed lateral-line scales (15-17 for *alleni*, compared to 13-15, modally 14, for *caudalis*). Also *C. alleni* does not seem to reach as large a size as *caudalis*; the largest specimen of *alleni* measures 62.2 mm SL.

It is apparent from underwater photographs and observations that *C. caudalis* is variable in life colour. As noted above, Marshall Islands and Line Islands individuals lack the bright blue pectoral axil. It is not known if all fish in other parts of the range exhibit this colour feature or not. Some individuals are very dark brown, almost black, and the caudal peduncle, caudal fin, and posterior dorsal and anal fins more contrastingly white than the holotype and the fish photographed underwater by Allen (1975) in the Solomon Islands.

Chromis delta sp. nov.

Figure 3

Chromis sp. "D" Allen, 1975: 95, upper fig. of p. 100.
Chromis sp. Burgess and Axelrod, 1975: 1563, fig. 320.
Chromis sp. 2 Allen and Steene, 1979: 43 (in part).

Material examined. Holotype: Solomon Islands, Guadalcanal, 7 miles W of Honiara, reef adjacent to wreck of Japanese ship, 38-48 m, rotenone, J.E. Randall and G.R. Allen, 13 Jul 1973, BPBM 15584, female (36.6 mm).

Paratypes: Fiji, entrance to Nukulau Pass (18°11'S, 178°32'E), outer reef, 35 m, spear and quinaldine, G.R. Allen, 7 Jun 1973, AMS I.17506-004 (2: 22.4-41.9 mm); NW tip of Great Astrolabe Reef, S of Usborne Pass (18°42'S, 178°29'E), ocean side of reef to 40 m, rotenone,

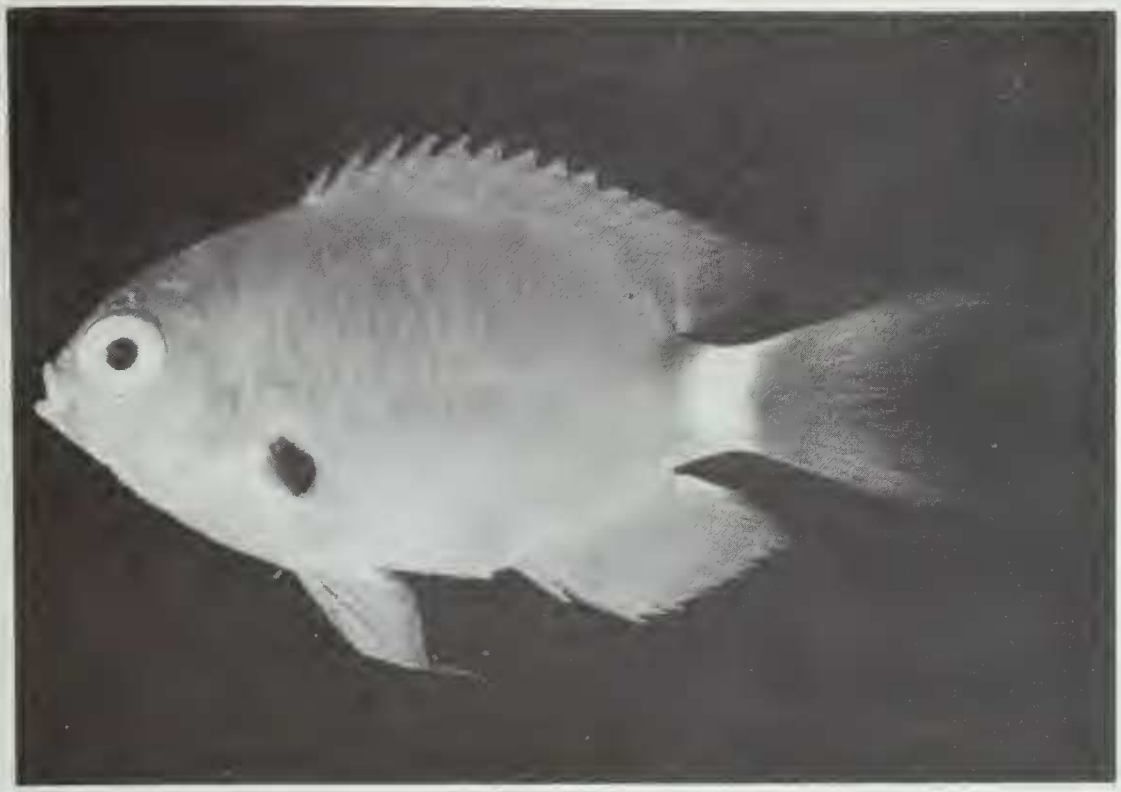

Figure 3. Holotype of *Chromis delta*, BPBM 15584, 36.6 mm SL, Guadalcanal, Solomon Islands.

V.G. Springer et al., 14 May 1982, BPBM 31158 (34: 13.9-48.7 mm).

Solomon Islands, same data as holotype, BPBM 30953 (3: 31.6-42.9 mm); Alite Reef (off Malaita), steep outer reef slope, 50 m, dynamite, J.E. Randall, W.A. Starck II, B. Goldman and W. Doak, 24 Jul 1973, BPBM 16188 (4: 31.7-39.4 mm).

Australia, Queensland, Great Barrier Reef, Lizard Island area, Australian Museum party, Nov 1975, AMS I.19476-020 (39.5 mm); Escape Reef (15°49′S, 145°50′E), reef and coral rubble, 52-60 m, rotenone, Australian Museum party, 4 Nov 1981, AMS I.22627-005 (2: 37.3-41.0 mm) same locality, Australian Museum party, 11 Nov 1981, AMS I.22632-008 (2: 44.0-45.5 mm).

Papua New Guinea, Madang, Kranket Island, outer reef slope, 30.5 m, rotenone, G.R. Allen, 10 Apr 1972, BPBM 14695 (9: 26.8-40.8 mm); Port Moresby, Bootless Inlet, Horseshoe Reef, ocean side, 37 m, P.L. Colin, 23 Jan 1984, BPBM 30252 (2: 18.2-28.7 mm).

Indonesia, Molucca Islands, Ambon, N side off Morilla, reef front with caves, 10-12 m, rotenone, J.E. Randall and G.R. Allen, 28 Jan 1975, BPBM 19358 (43.2 mm); Sulawesi (Celebes), Manado Bay, reef about 500 m from shore, 30 m, sodium cyanide, G.W. Tribble, 2 Sep 1978, BPBM 26678 (3: 17.0-49.3 mm); Banda Islands, Roen Island (4°32′36′S, 129°49′36″E), 9-15 m, rotenone, B.B. Collette, 8 Jul 1979, USNM 268413 (2: 18.5-38.7 mm); Bali, point just N of Padang Bai, base of reef front, 27 m, sodium cyanide and spear, J.E. Randall, 28 Feb 1984, BPBM 30187 (2: 24.3-33.5 mm).

Christmas Island (Indian Ocean), Flyingfish Cove, off cantilever, 25-35 m, rotenone, G.R. Allen and R.C. Steene, 27 May 1978, WAM P. 26099-026 (39.8 mm); Christmas Island, rotenone, G.R. Allen and R.C. Steene, 30 May 1978, AMS I.20441-008 (38.0 mm).

Palau Islands, Augulpelu Reef (SE of Koror), SW side, drop-off in 15.5-21 m, quinaldine, J.E. Randall, 13 Apr 1970, BPBM 30974 (2: 36.9-41.0 mm); same locality, 33.5-52 m, rotenone, J.E. Randall, A.R. Emery and E.S. Helfman, 22 Apr 1970, BPBM 9436 (11: 28.8-39.5 mm); Augulpelu Reef, S side, reef in 37-43 m, rotenone, J.E. Randall and R.L. Pyle, 15 Jul 1986, BPBM 31461 (23.8 mm).

Philippines, Mactan Island (E of Cebu), off marine laboratory of University of San Carlos, vertical drop off with caves and ledges, 28-35 m, spear and quinaldine, J.E. Randall, 26-27 Jun 1975, BPBM 18469 (2: 34.7-41.0 mm); Negros, off S end of Dumaguete City, isolated rock on rubble-soft coral bottom, 22 m, rotenone, J.E. Randall and K.E. Carpenter, 9 Aug 1978, BPBM 26512 (2: 19.1-26.3 mm); Luzon, Batangas, Caban Island, 45 m, rote-

none, J.E. Randall, G.W. Tribble and R. Tubbock, 13 Aug 1978, BPBM 26527 (40.4 mm).

Taiwan, S end, Nan Wan, middle of bay E of harbour at Hou-Pi-Hu, rocky pinnacle, 26 m, spear, J.E. Randall, 20 Jul 1978, BPBM 23435 (40.8 mm).

Diagnosis. Dorsal rays XII,13 (rarely 12 or 14); anal rays II,13 (rarely 12 or 14); pectoral rays 16 (rarely 15 or 17); spiniform caudal rays 2; tubed lateral-line scales 13 (12-14, rarely 14); gill rakers 7 + 19 (6-9 + 18-21).

Body depth 1.95 (1.8-2.1) in SL; head length 3.05 (2.95-3.2) in SL; snout length 4.0 (3.55-4.35) in head; orbit diameter 2.5 (2.3-2.8) in head; interorbital width 3.0 (2.7-3.0) in head; caudal peduncle depth 2.1 (1.95-2.15) in head.

No auxiliary scales on body. Posterior margin and corner of preopercle slightly irregular, sometimes with few poorly defined serrae. Nostrils as in preceding species except posterior nostril extremely small. Pores of lateralis system on head large. Free edge of suborbital ending posterior to a vertical at rear of pupil.

Fifth to twelfth dorsal spines subequal, 1.7 (1.6-1.8) in head; interspinous membranes of dorsal fin moderately incised; margin of soft portions of dorsal and anal fins acutely pointed, fifth or sixth dorsal rays and seventh or eighth anal rays longest; base of soft portion of dorsal fin contained about 2 times in base of spinous portion; second anal spine 1.35 (1.25-1.45) in head; caudal fin deeply forked, each lobe tip with 2 long filamentous rays, caudal concavity 3.0 (3.2-4.35) in SL; pectoral fins not long, 3.0 (2.9-3.35) in head; pelvic fins 2.6 (2.4-3.0) in head.

Colour of holotype in alcohol. Brown, scale edges darker than centres, anterior caudal peduncle with narrow dark brown bar which continues vertically into basal part of dorsal fin where it is darker than on body; rest of caudal peduncle abruptly pale; large subspherical black spot centred on pectoral-fin base, axil of fin also black; dorsal and anal fins brown except region posterior to curved line from base to pointed tips of these fins which is abruptly pale; caudal fin dusky brown basally, grading to pale distally; pectoral fins pale except basal dark spot; pelvic fins brown laterally, inner 2 rays and associated membranes pale.

Colour of holotype when fresh. Not very different from that in preservative. Ventral part of the body bluish grey, this coloration palest anterior to black pectoral-base spot and along lower edge of gill opening; lips bluish grey; suborbital suffused with iridescent light blue; small light blue spot on snout beneath anterior nostril; broad white bar over all but anterior caudal peduncle; iris bluish, inner rim lighter.

Underwater photographs of this species were taken by the author in Sulawesi and Luzon. The fish were dark grey, the scale edges even darker (due to the dark ground colour, the dark bar anteriorly on the caudal peduncle is only barely noticeable); caudal peduncle posterior to dark bar abruptly white; suborbital scales largely iridescent blue; upper lip partially blue; a short blue streak beneath anterior nostril; iris blue, the inner rim lighter blue; short, curved, posterior part of dorsal and anal fins clear with dusky rays; outer margin of dorsal and anal fins narrowly blue; caudal and pectoral fins clear with dusky rays; pelvic fins dark olive grey with a blue lateral margin.

Specimens from Fiji have a distinct blackish bar anteriorly on the caudal peduncle which extends into the anal fin as as well as the dorsal; this colour form was well illustrated by Allen (1975: upper figure of p. 100).

Etymology. Named *delta* from the fourth letter of the Greek alphabet in order to be linked with the previous designation of this fish, *Chromis* sp. "D" by Allen (1975).

Distribution and habitat. This species occurs in the western Pacific from Taiwan through the Philippines to Indonesia, New Guinea, Solomon Islands, and northern Great Barrier Reef. It extends eastward in Oceania only to the Palau Islands and Fiji. It has also been collected at Christmas Island in the eastern Indian Ocean. The typical habitat is steep outer reef slopes with good cover. Type specimens have been collected in the depth range of 10-60 m, but the species is not common in less than 20 m. Allen (1975: 95) recorded it to 80 m and noted that it is the most common pomacentrid fish in the Palau Islands at depths of 60-70 m. It is abundant on drop-offs in the Philippines and Indonesia as well.

Remarks. Chromis delta is a small species, the largest of the type specimens measuring only 49.3 mm SL and 73 mm in total length. Mature females as small as 32 mm SL are present in the type series.

Chromis delta is closely related to *C. caudalis.* Although Allen (1975: 94-95) distinguished the two as species C and D, respectively, Allen and Steene (1979) decided that D is the juvenile and C the adult of the same species. The two, however, are valid species. There is clear though overlapping meristic separation, as shown in Tables 1 and 2, for pectoral rays, tubed lateral-line scales, and gill rakers. In addition, *C. caudalis* has a deeper body on the

average, longer caudal filaments (when fully intact), and longer pectoral fins. Measurements of pectoral-fin lengths were made on 19 adult specimens of *caudalis* and 30 of *delta*. The SL/pectoral fin ratio for *caudalis* ranged from 2.63-2.89 whereas that for *delta* 2.90-3.39. The colour of the two species is very similar, but there is a difference in the shape of the large dark spot at the pectoral base; it is hemispherical in *caudalis*, the straight portion lying on the pectoral base, and essentially round in *delta*, with about half of the spot lying anterior to the fin base. Also *delta* lacks the dark line on the side of the snout, the faint striping ventrally on the body, and the bright blue pectoral axil in life.

Chromis delta is also very closely related to an undescribed species of the genus of which the author has specimens only from the Maldive Islands. The colour is almost identical to that of *delta*. The Maldives fish differs in having modally 12 dorsal soft rays, 23-27 gill rakers, and less pointed soft portions of the dorsal and anal fins.

Acknowledgements

Support for this study was provided by grants from the National Science Foundation (No. GB-8732) and the Charles Engelhard Foundation; these grants are gratefully acknowledged. Thanks are also due the individuals who collected the specimens of *Chromis* reported herein and the ichthyological staffs of the following institutions for the loan of specimens: Australian Museum, U.S. National Museum of Natural History, and the Western Australian Museum. The manuscript was reviewed by Gerald R. Allen and Helen A. Randall.

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